

# PATENT SPECIFICATION

DRAWINGS ATTACHED

890.348



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No. 22819/60.

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(Patent of Addition to No. 880,486 dated Dec. 10, 1958).

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## COMPLETE SPECIFICATION

### Improvement in Liquid Applicators

5 We, THOMAS HEDLEY & CO. LIMITED, a British Company, of Phoenix Buildings, Collingwood Street, Newcastle upon Tyne 1, England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to liquid applicators and more particularly to an improved applicator for applying thin films of liquid to a surface. The applicator is especially suited for applying liquid deodorants, suntan oils, insect repellants, liquid soaps and detergents, 15 perfumes, astringents, depilatories and other liquid products to the human skin.

20 In Patent Specification No. 880,486 there is described and claimed an application for dispensing liquids from a container, comprising a dispensing reservoir of variable volume located above the container when the applicator is in a normal upstanding position, an apertured transverse wall extending across an 25 outlet of the liquid container and constituting a lower side of the reservoir, a draft tube, in open communication with the reservoir, depending from the aperture in the transverse wall and extending into the interior of the container to adjacent the bottom thereof, 30 through which tube liquid may be drawn from the container and charged to the reservoir, and a resiliently flexible diaphragm constituting an upper side of the reservoir and provided with one or more apertures through 35 which the liquid in the reservoir may be dispensed upon depression of the diaphragm when brought into contact with a surface to which liquid is to be applied, the maximum volume of the reservoir being greater than 40 the volume of the bore of the draft tube.

Under certain circumstances it has been found desirable to improve upon the ability of the applicator to dispense liquid when first touched to the surface to which liquid is to

45 be applied, i.e. the human skin, in order to avoid the initial dry "feel" and drag of the applicator diaphragm surface. The present invention seeks to provide an applicator from which liquid may be more easily dispensed as soon as the diaphragm surface contacts the 50 skin or other surface.

In accordance with the present invention, the resiliently flexible diaphragm, constituting the upper side of the reservoir, of the applicator claimed in Patent Specification No. 55 880,486, is provided with one or more concavities and with at least one opening within the area of each concavity through which opening or openings liquid in the reservoir may be dispensed upon depression when brought into contact with a surface to which 60 liquid is to be applied.

The diaphragm may be provided with one concavity having one opening or a plurality of openings within the area thereof. Alternatively, the diaphragm may be provided with a plurality of concavities each having one or more openings within its area. Furthermore, the diaphragm may be provided with one or more openings outside the area of the 70 opening or openings outside the area of the concavity or concavities; liquid is dispensed through the openings in the diaphragm when the latter is depressed against a surface; the concavity acts to space the opening from the 75 surface sufficiently to permit substantial outflow of liquid on initial contact of the diaphragm with the surface.

Embodiments of the present invention are illustrated in the accompanying drawing, in 80 which:—

Figure 1 is an elevation of a typical container including cap in which the improved liquid applicator has been installed;

Figure 2 is a cross-section taken along the 85 line 2—2 of Figure 1 showing the applicator assembled in the container neck;

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Figure 3 is a plan view of the liquid applicator and container of Figure 2;

Figure 4 is a plan view of a modified form of liquid applicator; and

5 Figures 5 and 6 are fragmentary elevations in cross-section showing modified forms of the applicator diaphragm.

Referring to the drawing and particularly Figures 1—3, there is shown a container 11 having a threaded neck 12 and an opening 13. The container 11 may be of glass or any other material that is compatible with the liquid stored therein. A cap 14 is provided to close the container as by engaging the threads on the neck 12.

15 The liquid applicator is composed of an adaptor member 15 having a relatively rigid transverse wall 16 with an integral annular wall 17 depending therefrom. The outer surface of the annular wall 17 is designed to fit snugly into the opening 13 of the container 11. The transverse wall 16 is provided with an aperture 18 having a draft tube 19 fitting snugly therein. The draft tube 19 may be heat sealed in the aperture 18, although a snug interference fit will be satisfactory for most purposes. The draft tube 19 extends substantially to the bottom of the container 11.

20 A thin resilient applicator diaphragm 20 is assembled with the adapter member 15. The diaphragm 20 has a concavity 21 and a relatively small opening 22. An integral annular skirt-like extension 23 depends downwardly from the upper portion of the diaphragm 20. The upper portion of the diaphragm 20 is substantially hemispherical in shape although the concavity 21 does, to some extent, break up the normally smooth contour of the diaphragm surface. In a preferred form, the diaphragm, as illustrated, is shaped like a partially flattened hemisphere or watch glass. It will be understood, of course, that other shapes can be used with satisfactory results so long as a concavity is provided with at least one opening therein as this has been found necessary to improve the ability of the applicator to dispense liquid on initial contact of the diaphragm with a surface.

25 The annular wall 17 of the adapter member 15 is provided with a narrow annular slot 24, which is adapted to receive the annular extension 23. The slot 24 is designed to wedge and grip the annular extension 23 in assembled relation when the adapter member 15 is pressed into the opening 13 of the container 11. A vent channel 25 for purposes described below may also be provided in the annular wall 17.

30 The volume bounded by the top surface of the transverse wall 16 and below the diaphragm 20 comprises a liquid reservoir 26. The maximum volume of the reservoir 26 must be greater than the volume of the bore in the draft tube 19 in order to obtain satisfactory results. Poor performance will result

if these volumes are substantially equal and the device is inoperative when the volume of the draft tube bore exceeds the volume of the reservoir.

The adapter member 15 and the diaphragm 20 may be molded from typical chemically inert plastics materials such as polyethylene, for example. Other materials can be used where they are compatible with the liquid being dispensed. The use of a molded polyethylene diaphragm 20 affords a smooth outer applicator surface which does not irritate even the most sensitive of human skin.

70 In assembling the applicator to a container, the annular wall 17 is pressed into the opening 13 causing compression of the air confined in the space 27 above the liquid in the container. As the adapter member 15 is forced downwardly beyond the end of vent channel 25, the air trapped in the space 27 forces liquid up through the draft tube 29 and into the reservoir 26 so that the reservoir is filled when the adapter member 15 is assembled to the container. It has been found that an air bubble 28 tends to form and remain in the upper portion of the liquid reservoir 26.

80 If, on assembly, the reservoir 26 is completely filled with liquid, the air bubble 28 will form after the diaphragm 20 is deflected and released one or more times. The primed applicator may be used immediately. Alternatively the cap 14 may be screwed on the primed applicator and the applicator shipped and/or stored until needed. The applicator remains primed whether used immediately or after a period of storage.

85 Liquid can be applied by merely rubbing the diaphragm 20 over the skin or other surface. There is no need to invert the container. The surface of the diaphragm 20 is pressed against the surface to which the liquid is to be applied and is rubbed over the surface with a circular motion. While it is rubbed the pressure of the diaphragm against the surface is alternately raised and lowered causing the diaphragm to be alternately depressed and released and the aperture or apertures and each concavity therefor is or are alternately covered in liquid-tight fashion by the surface and left open. During any part of the rubbing operation that the concavities are covered is liquid-tight fashion while the diaphragm 20 is being depressed, portions of the air in the bubble 28 move down the tube 19 and rise into the space 27. This increases the pressure in the space 27 and tends to force additional liquid up the tube 19. During any portion of the cycle that a concavity is uncovered liquid can flow through the opening or openings in said concavity when the diaphragm is depressed or even when the diaphragm is not depressed due to the increase in pressure in the space 27. Liquid is applied in this manner and its application may continue indefinitely.

After the application of liquid the diaphragm is taken out of contact with the surface thereby allowing the diaphragm quickly to restore itself to its original shape so that additional air is drawn into the reservoir 26 through the openings or apertures to enlarge the air bubble 28. Some of the air in the air bubble is then forced back through the openings or apertures as the pressure of air in the space 27 tends to force additional liquid up the draft tube 19 until a condition of equilibrium is achieved.

Additional liquid may be forced into the reservoir in this same manner, i.e. without using the device for applying a liquid film to a surface. This can be accomplished by merely placing the end of the finger or any object over the concavity 21 thereby closing the opening 22 and then depressing and releasing the diaphragm 20 one or more times. With each depression of the diaphragm 20, the air in the bubble 28 will be compressed and a portion of it (in the form of small bubbles) will be forced down the draft tube 19 to rise into the air space 27 so that additional liquid will be forced up the draft tube 19 and into the reservoir 26 each time the diaphragm 20 is released.

The improvement in liquid application on initial contact of the diaphragm 20 results from the spacing of the opening 22 away from the normal outer contour of the diaphragm 20. When the diaphragm is first touched to a surface which is to be wetted, the surface will not cover the opening 22 and restrict outflow of liquid as it might in the absence of the concavity 21. A slight depression of the diaphragm 20 results on initial contact with a surface and this forces immediate flow of liquid through the opening 22 thus filling that concavity 21 and greatly facilitating the initial application of liquid and wetting of the diaphragm surface. The normal action of rubbing the applicator back and forth as when applying deodorant to the armpits, causes sufficient depression and release of the diaphragm 20 to cause continuous outflow of liquid from the reservoir 26 and thereby permits continuous application to an area of any size.

The air bubble 28 serves the additional function of preventing liquid overflow due to barometric pressure changes and/or temperature variations.

The length of the annular wall 17 may be such that an excessive quantity of liquid is forced up the draft tube 19 and into the liquid reservoir 26 by compression of air in space 27 when the adapter member 15 is attached to the container. The regulating vent channel 25 is provided in order to reduce the quantity of liquid forced into the liquid reservoir 26 on assembly. The amount of liquid forced up the draft tube 19 and into the reservoir 26 can be varied by changing the length of

the vent channel 25 for a given size of adapter 15. For example, if the vent channel is as long as the annular wall 17 no liquid will be forced into the liquid reservoir 26 on assembly since the air which is displaced on insertion of the adapter member into the space 27 will all escape through the vent channel 25 when the device is assembled. Thus, by simple experiment, the optimum length of vent channel 25 can be found which will just fill the reservoir 26 when the adapter member 15 is assembled with the container 11.

Figure 4 illustrates a modified form of the invention in which three relatively small openings 22 are provided inside the concavity 21. This illustrates that any number of openings 22 can be provided in the concavity 21 to obtain satisfactory dispensing and application of liquid. The number and spacing of the openings 22 being a matter of design and will depend on such variables as the physical properties of the liquid being dispensed, the rate of dispensing desired, the size of the applicator and many others as will be appreciated by those skilled in the art.

Another modified form of the invention is shown in Figure 5. In this modification, openings 29 are provided outside the concavity 21 to supplement the opening 22 inside the concavity 21. The necessity of providing the openings 29 will also depend on the dispensing requirements of a particular product.

The invention is not necessarily limited to a diaphragm 20 having a single concavity 21. For example, the use of three concavities 30, 31 and 32 each having a single opening 33, 34 and 35, respectively, is shown in Figure 6. It is thus evident that any number of concavities may be used in which each concavity has at least one opening, and, in addition, any number of additional openings on the smooth diaphragm surface and outside the concavities may, of course, be provided. The number of combinations possible are quite numerous, obviously, and the particular design that might be adopted will, in most cases, be dictated by the dispensing requirements as previously indicated. The only requirement that must be met in using multiple concavities, this being a requirement for single cavities also, is that the concavities be of such size and so spaced that they are normally bridged by the skin of the user in order to obtain the proper liquid forcing action. Such action would normally be attained when, for example, the applicator is used in applying a liquid deodorant to the armpits.

#### WHAT WE CLAIM IS:—

1. An applicator, for dispensing liquids from a container, as claimed in any claim of Application No. 39890/58 (Serial No. wherein the resiliently flexible dia-

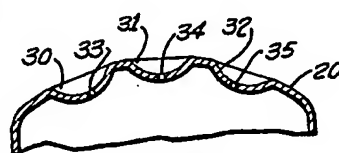
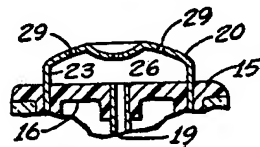
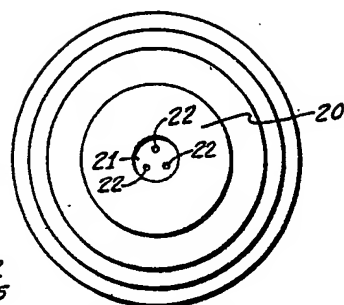
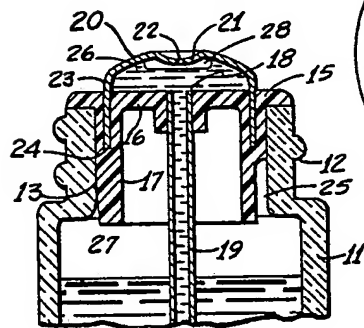
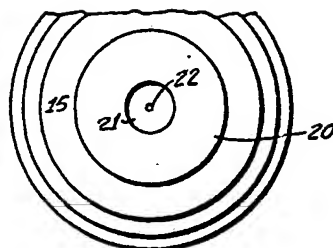
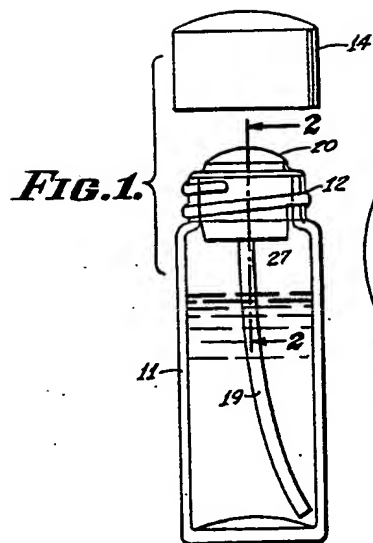
- phragm, constituting the upper side of the reservoir, is provided with one or more concavities and with at least one opening within the area of each concavity, through which opening or openings liquid in the reservoir may be dispensed upon depression of the diaphragm when brought into contact with a surface to which liquid is to be applied.
- 5 2. An applicator according to Claim 1 wherein the diaphragm is provided with one concavity and with one opening within the area thereof.
- 10 3. An applicator according to Claim 1 wherein the diaphragm is provided with one concavity and with a plurality of openings within the area thereof.
- 15 4. An applicator according to Claim 1 wherein the diaphragm is provided with a plurality of concavities and with a plurality of openings, there being one or more openings within the area of each concavity.
5. An applicator according to any preceding claim wherein the diaphragm is provided with one or more openings outside the area of the concavity or concavities.
- 25 6. An applicator for dispensing liquids from a container substantially as described hereinbefore with reference to the accompanying drawing.

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## Improvements in liquid applicators

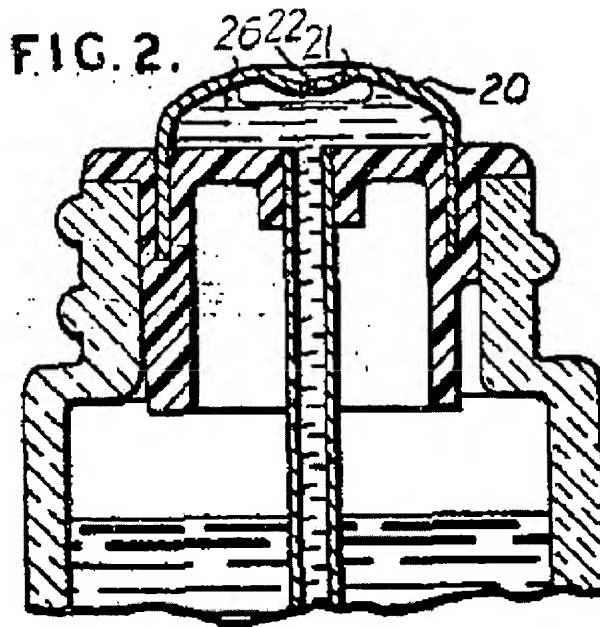
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Applicant: HEDLEY THOMAS & CO LTD  
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### Abstract of GB890348

890,348. Diaphragm pumps; dispensing liquids. HEDLEY & CO. Ltd., THOMAS. June 29, 1960 [July 6, 1959], No. 22819/60. Addition to 880,486. Classes 102(1) and 102 (2). In a liquid applicator as described in the parent Specification, the resiliently flexible diaphragm 20 constituting the upper side of the reservoir 26, is provided with at least one concavity 21 having at least one opening 22 through which liquid is dispensed upon depression of the diaphragm when brought into contact with a surface to be wetted. The provision of the concavity prevents the covering of the opening 22 and the initial restriction of flow therethrough. Modifications are shown with three openings in one cavity, three cavities with one opening in each and one cavity with a single opening surrounded by further openings outside the area of the concavity.



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### Description of GB890348

### PATENT SPECIFICATION